

राज्यातील रस्त्यांचे बांधकाम, देखभाल,
दुरुस्तीबाबत मार्गदर्शक सुचना.

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
शासन परिपत्रक क्र. आरएमआर-१०८२/ प्र.क्र.३१५/रस्ते-१,
मंत्रालय, मुंबई ४०० ०३२
दिनांक : ३० सप्टेंबर, २०१६

प्रस्तावना:

सार्वजनिक बांधकाम विभागाकडील अनेक जबाबदाऱ्यांपैकी राज्यातील प्रमुख राज्य मार्ग, राज्यमार्ग व प्रमुख जिल्हा मार्ग दर्जाच्या रस्त्यांची देखभाल दुरुस्तीची मोठी जबाबदारी आहे. या रस्त्यांच्या लांबीच्या प्रमाणात मानकांप्रमाणे उपलब्ध होणे आवश्यक असलेल्या अनुदानापेक्षा खूप कमी उपलब्ध होणाऱ्या अनुदानामुळे बऱ्याचदा काही रस्त्यांच्या देखभाल दुरुस्तीकडे हवे तसे लक्ष देणे शक्य होत नाही. त्यामुळे या बाबीकडे शासनाने गांभीर्याने लक्ष पुरवून राज्यातील सर्व रस्ते चांगल्या दर्जाचे व खड्डेमुक्त कसे होतील याबाबत प्राथमिकता देऊन त्याची अंमलबजावणी करणे आवश्यक आहे.

मा.उच्च न्यायालय, मुंबई यांनी जनहीत याचिका क्र.७१/२०१३ संदर्भात दिलेल्या सूचनाप्रमाणे राज्यातील रस्त्यांच्या तसेच सार्वजनिक बांधकाम विभागाकडील रस्त्यांच्या देखभाल व दुरुस्ती संदर्भात पुढीलप्रमाणे कार्यवाही करण्याचे आदेशित केले आहे. "Common Guidelines be issued by Public Works Department in two weeks specifying the advance scientific standards to be maintained for construction of roads, maintenance of roads and filling of potholes. A committee be formed and invite authorized representative of the Indian Road Congress organization from New Delhi and take suggestion and convey a meeting in this regard and issue such guidelines/circular in regard to scientific standards to be maintained for construction of road, filling up of potholes and maintenance of roads, etc. Such circular has to be issued within a periods of two weeks."

मा.उच्च न्यायालय, मुंबई यांच्या वरील सूचनांना अनुसरून सा.बां. विभागाने शासन निर्णय क्रमांक याचिका-२०१३/प्रक्र ११४/२०१३/रस्ते-६ दिनांक १०/०९/२०१५ अन्वये राज्यातील रस्त्यांच्या बांधकाम आणि देखभाल दुरुस्तीच्या सध्याच्या कार्य पध्दतीचा एकंदरीत आढावा घेवून परिस्थितीत अमुलाग्र सुधारणा होवून राज्यातील रस्ते खड्डेमुक्त करण्यासाठी प्रतिबंधात्मक तसेच सुधारणात्मक कार्यपध्दती सूचविणेसाठी समितीची स्थापना केली होती. उपलब्ध प्रगत तंत्रज्ञानाचा अभ्यास करून रस्त्यांच्या देखभाल दुरुस्तीसाठी भारतीय रस्ते महासभेने निर्धारित केलेल्या प्रगत तंत्रज्ञान व मानके यांचेशी सुसंगत मानके व कार्यपध्दती सूचविणेबाबतची बाब समितीच्या कार्यक्षेत्र समाविष्ट करण्यात आली होती. त्या अनुषंगाने मोठ्या प्रमाणात माहिती प्राप्त करून त्यावर विचारविमर्श करून समितीने आपल्या शिफारशी शासनास सादर केल्या आहेत. समितीच्या शिफारशी विचारात घेवून रस्त्यांच्या देखभाल दुरुस्तीसाठी व बांधकामासाठी मार्गदर्शक सुचना निर्गमित करण्याची बाब शासनाच्या विचाराधीन होती.

शासन परिपत्रक:

उपरोक्त समितीच्या शिफारशी विचारात घेऊन रस्त्यांच्या देखभाल व दुरुस्ती बाबत पुढील प्रमाणे मार्गदर्शक सुचना निर्गमित करण्यात येत आहेत:-

रस्त्यांचे आयुष्यमान संकल्पानातील कालावधी पर्यंत रहाण्यासाठी रस्त्यांचे बांधकाम देखभाल व दुरुस्ती आणि बांधकामे ही प्रभावीपणे व तत्परतेने वेळेच्यावेळी होवून रस्ते वापरासाठी सुखकर रहाण्यासाठी आवश्यक असलेल्या मार्गदर्शक सुचना खालील टप्प्यात विभागण्यात आल्या आहे.

भाग -१ रस्त्याची देखभाल / दुरुस्ती

१. तपासणी

१.१ रस्ते तपासणी बाबतची वारंवारता व कालावधी .

१.२ तपासणी दरम्यान लक्ष देण्याचे मुद्दे.

१.३ पावसाळ्यापूर्वी , पावसाळ्यात व पावसाळ्यानंतर करावयाची कार्यवाही.

(या बाबतच्या कार्यवाहीबाबत सविस्तर सुचना परिशिष्ट १.१ ते १.३ प्रमाणे स्वतंत्रपणे जोडण्यात आल्या आहेत.)

२. दुरुस्ती / सुधारणा.

२.१ डांबरी पृष्ठभागावरील दोषांबाबतची लक्षणे, कारणे व करावयाच्या दुरुस्ती / सुधारणेचा प्रकार.

२.२ विविध प्रकारच्या रस्त्यांसाठी दुरुस्ती/सुधारणेचे वेळापत्रक.

२.३ पृष्ठभागावरील दोषांनुसार करावयाची कार्यवाही व प्राधान्यता.

(या बाबतच्या कार्यवाहीबाबत सविस्तर सुचना परिशिष्ट २.१ ते २.३ प्रमाणे स्वतंत्रपणे जोडण्यात आल्या आहेत.)

३. दुरुस्ती/ सुधारणेच्या कामांसाठीचे मानके

३.१ MORT & H च्या Specifications for Road and Bridge Works,

सुलभ संदर्भासाठी Section ३००० परिशिष्ट ३ मध्ये उद्धृत करण्यात आले आहे.

३.२ खड्ड्यांची दुरुस्ती MPM अथवा अन्य मानकांने करावयाची झाल्यास त्यासाठी मुख्य अभियंता यांनी प्राप्त परिस्थितीनुसार त्यांचे कार्यक्षेत्रासाठी अथवा ठराविक क्षेत्रासाठी परिपत्रक निर्गमित करावे.

४. रस्ते दुरुस्ती / बांधकामा करीता उपलब्ध असलेली अद्यावत यंत्रसामुग्री

अद्यावत यंत्रसामुग्री ही बहुतांशी प्रगत राष्ट्रांनी त्यांचेकडील प्राप्त परिस्थितीनुसार विकसित केली असल्याने ती भारतातील रस्त्यांसाठी वापरात आणावयाची झाल्यास, ही यंत्रसामुग्री आपल्या येथील प्राप्त परिस्थितीला अनुकूल आहे काय याची प्रथम खात्री करून घेणे आवश्यक आहे. अशी खात्री झाल्यानंतर अशा अद्यावत यंत्रसामुग्रीच्या वापरास चालना देण्यासाठी ही यंत्रसामुग्री विकत घेण्यापेक्षा प्रथम रस्त्यांची दुरुस्ती / सुधारणा करण्याच्या कामासाठी ठेकेदाराशी करावयाच्या निविदा मसूद्यात अशा प्रकारची अद्यावत यंत्रसामुग्री उपलब्ध करू शकणा-या अथवा मालकीच्या असणा-या कंत्राटदारांकडूनच निविदा मागविण्यात येऊन दुरुस्तीची / बांधकामाची कामे करून घ्यावीत.

याबाबतचा तपशील सोबतच्या परिशिष्ट ४ प्रमाणे विहित करण्यात आला आहे.

५. रस्ते दुरुस्ती / सुधारणे करीता उपलब्ध असलेले अद्यावत साहित्य

उपलब्ध अद्यावत साहित्य हे रस्त्यांच्या दुरुस्त्या तात्काळ करण्यासाठी उपयोगी आहेत परंतु त्यांची सध्याची किंमत ही भारतात पारंपारीक पद्धतीने वापरण्यात येणा-या साहित्याच्या मानाने खूप जास्त आहे. तसेच ह्या साहित्यासाठी भारतीय मानके अद्याप अस्तित्वात नाहीत. ही बाब विचारात घेऊन अशा प्रकारच्या अद्यावत साहित्याचा वापर करण्याकरीता “पुरवठादार” व “वापरणारा विभाग”

यांचेत द्विपक्षीय करार करण्याऐवजी “पुरवठादार”, “वापरणारा विभाग” व “रस्ते बांधकाम क्षेत्रातील केंद्राच्या अथवा राज्याच्या संशोधन / शैक्षणिक संस्था” (ज्यांनी ह्या साहित्यावर अभ्यास करून त्याचा वापर प्रमाणित केला आहे.) ह्यांच्यात त्रिपक्षीय करार करून अशा अद्ययावत साहित्याचा वापरा बाबत कार्यवाही करावी.

याबाबतचा तपशील सोबतच्या परिशिष्ट ५ मध्ये विहित करण्यात आला आहे.

६. डोंगराळ भागातील रस्ते दुरुस्ती व देखभाली संदर्भात.

राज्यातील सा.बां. विभाग व नगर पालिकेच्या अखत्यारीतील काही रस्ते डोंगराळ भागात येतात. या भागांमध्ये रस्त्यांची दुरुस्ती व देखभाल करणे तसेच मुळ स्वरूपाची बांधकामे करतांना विशेष काळजी घेणे आवश्यक ठरते. या डोंगराळ भागातील रस्त्यांची कामे करतांना काही विशेष बाबींकडे लक्ष देणे आवश्यक आहे.

याबाबतचा तपशील सोबतच्या परिशिष्ट ६ मध्ये विहित करण्यात आला आहे.

७. रस्त्यांच्या बांधकामामध्ये विविध सुविधा उपलब्ध करून देण्यासाठी टाकण्यात येणा-या लाईन्समुळे होणारी रस्त्याची नादुरुस्ती व त्यासंदर्भात घ्यावयाची काळजी.

राज्यातील नगर पालिका व महानगरपालिका क्षेत्रांमध्ये तसेच सार्वजनिक बांधकाम विभागाच्या अखत्यारीत रस्त्यांच्या संदर्भात विविध शासकीय/निम शासकीय/खाजगी यंत्रणाद्वारे विविध सेवा वाहिन्या टाकण्याची कामे करण्यात येतात. या सेवा वाहिन्या टाकतांना रस्त्याचे खोदकाम करून सेवा वाहिन्या टाकण्याचे काम करण्यात येते. सदर बाब विशेषतः नगरपालिका व महानगरपालिका क्षेत्रातील रस्त्यांच्या संदर्भात प्रामुख्याने विचारात घेणे आवश्यक आहे. यामुळे सेवा वाहिन्या उपलब्ध करून देतांना घ्यावयाच्या काळजी संदर्भात सविस्तर मार्गदर्शक सुचना संबंधीत महानगरपालिका/नगरपालिकांनी त्यांच्या कार्यक्षेत्रासाठी निश्चित करणे आवश्यक आहे.

याबाबतचा तपशील सोबतच्या परिशिष्ट ७ मध्ये विहित करण्यात आला आहे.

भाग - २ रस्त्याची बांधकामे

भारतीय रस्ते महासभेने (Indian Roads Congress) रस्ते बांधकामासाठी अद्यायावत अशी सविस्तर मानके वेळोवेळी प्रसिध्द करीत असते. त्यानुसार रस्ते बांधकामासाठी भारतीय रस्ते महासभेने प्रसिध्द केलेली Specification for Road & Bridge Works ह्या संदर्भातील अद्यायावत मानकांचा वापर करण्यात यावा.

भाग -३ अद्यायावत यंत्रसामुग्रीचा व साहित्याचा वापर करण्यासाठी सल्लागाराची नेमणूक, अभियंत्यांना प्रशिक्षण देणे

पारंपारीक साहित्य व यंत्रसामुग्रीचा वापर करताना रस्त्याची दुरुस्ती होण्यास बहुतेक वेळा विलंब होतो. आता बदलत्या जागतिकीकरणाच्या परिस्थितीतील सदर दुरुस्ती ही अद्यायावत साहित्य व यंत्रसामुग्रीचा वापर करून जलदगतीने व शाश्वत होणे ही काळाची गरज ठरली आहे. सदरील साहित्य व यंत्रसामुग्री ही प्रगत राष्ट्रांनी तेथिल प्राप्त परिस्थिती व गरजांनुसार विकसीत केलेली असून ती आहे तशीच भारतात वापरात आणणे योग्य होणार नाही. तरी ती आपल्या प्राप्त परिस्थितीत व गरजांनुसार सुधारीत / बदल करून घेण्यासाठी त्याचा योग्य असा अभ्यास करणे आवश्यक आहे. अशा अभ्यासासाठी केंद्र / राज्य शासनाच्या अखत्यारीतील या क्षेत्रात काम करणा-या संशोधन / शैक्षणिक संस्था यांना सल्लागार म्हणून नेमणे आवश्यक आहे व त्यांनी अभ्यासा अंती दिलेल्या अभिप्रायानुसार अद्यायावत साहित्य / यंत्रसामुग्रीचा वापर करण्यात यावा. तसेच सार्वजनिक बांधकाम विभागातील / महानगरपालिकेतील कार्यरत असलेल्या अभियंत्यांचे ह्या क्षेत्रात प्रशिक्षण होणे गरजेचे आहे.

सल्लागार नेमणे व अभियंत्यांना प्रशिक्षण देणे ह्या बाबींवर संबंधीत यंत्रणानी त्यांना रस्ते विकासासाठी प्राप्त होणा-या उपलब्ध निधिच्या २ टक्के रक्कम खर्च करण्यास हरकत नाही.

भाग- ४ सर्वसाधारण सुचना

४.१ महानगरपालिका / नगरपालिका क्षेत्रात दाट वस्तीतून जाणा-या रस्त्यांवर पाण्याचा निचरा होण्यासाठी आवश्यक जलनिस्सारणाची व्यवस्था ब-याच रस्त्यांसाठी कायम कार्यरत राहत नसल्याने असे रस्ते नेहमीच क्षतिग्रस्त होतात असा अनुभव आहे. अशा रस्त्यांसाठी ते अधिक टिकाऊ होण्यासाठी डांबरीकरणाऐवजी क्राँक्रीटीकरण करण्यात यावे. क्राँक्रीटीकरणाच्या तरतुदींचे संकल्पन या क्षेत्रातील तज्ञ सल्लागार / संस्था यांचेकडून करून घेणे बंधनकारक राहिल.

४.२ महानगरपालिका / नगरपालिकेच्या वाढीव हद्दीत नविन रस्ते तयार करताना रस्त्याच्या प्रचलित पध्दतीनुसार सुमारे १.५ ते २ फुट उंचीचा भराव करून रस्त्यांची कामे करण्यात येतात. परिणामी या रस्त्यांच्या भरावामुळे कृत्रिम बांध तयार झाल्याने पावसाळ्यात परिसरातील पाण्याचा निचरा होऊ शकत नाही. अशा परिस्थितीत रस्त्या लगतच्या प्लॉटधारकास सुध्दा कृत्रिम रित्या त्याचा प्लॉट मातीने भरून घेणे आवश्यक ठरते. त्यामुळे नैसर्गिक स्रोतांचा अनावश्यक वापर होतो.

ही बाब टाळण्यासाठी महानगरपालिका / नगरपालिकेच्या वाढीव हद्दीत नविन रस्त्यांचे बांधकाम करताना अस्तित्वातील जमिनीत आवश्यकतेनुसार खोदकाम करून त्यात योग्य अशा साहित्याचा वापर करून परिसराच्या सर्वसाधारण पातळीपेक्षा सुमारे १० ते १५ सेमी. उंच असलेला रस्ता बांधण्यात यावा.

४.३ खड्डे भरण्याचे कामकाज पारदर्शक पध्दतीने , तत्परतेने व जबाबदारीने होण्यासाठी Real Time Pothole Tracking System सारख्या पध्दतीचा वापर करणे सन २०१७ पासून बंधनकारक करण्यात यावे.

४.४ रस्त्यांची मुळ बांधकामे / मजबुतीकरणाची कामे करतांना IRC- 37 व IRC- 81 नुसार आवश्यक Crust Design करून, त्यानुसार Treatment देण्यात यावे.

२. सार्वजनिक बांधकाम विभाग, महानगरपालिका व नगरपालिका यांचेकडील सर्व क्षेत्रीय अभियांत्रिकी तसेच पर्यवेक्षीय अधिकारी / कर्मचारी यांनी रस्त्यांच्या योग्य देखभाल दुरुस्तीसाठी या मार्गदर्शक सूचनांचे आजपासूनच काटेकोरपणे पालन करावे.

३. हे परिपत्रक नगर विकास विभागाने त्यांच्या अनौपचारिक संदर्भ क्र.११२/यूओर/११६ दि. १९/०८/२०१६ अन्वये दिलेल्या सहमतीने निर्गमित करण्यात येत आहे.

४. सदर शासन परिपत्रक महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेतस्थळावर उपलब्ध करण्यात आले असून त्यांचा संगणक संकेतांक २०१६०९३०१७०४२४४३१८ असा आहे. हे शासन परिपत्रक डिजिटल स्वाक्षरीने सांक्षातिक करून निर्गमित करण्यात येत आहे. मार्गदर्शक सूचना यापूर्वीच्या सर्व परिपत्रकांना अधिक्रमीत करीत आहेत.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने

(प्रकाश इंगोले)

अधिक्षक अभियंता तथा उपसचिव

प्रत,

१. महालेखापाल-१, मुंबई/महालेखापाल-२, नागपूर.
२. सचिव (रस्ते) यांचे स्वीय सहायक, सा.बां.विभाग, मंत्रालय, मुंबई ३२.
३. सचिव (बांधकामे) यांचे स्वीय सहायक, सा.बां.विभाग, मंत्रालय, मुंबई ३२.
४. प्रधान सचिव (नगर विकास), मंत्रालय, मुंबई-३२.
५. सर्व मंत्रालयीन विभाग.

प्रत माहिती व आवश्यक कार्यवाहीसाठी -

१. सर्व उप सचिव, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई ३२.
२. सर्व मुख्य अभियंता, सार्वजनिक बांधकाम प्रादेशिक विभाग,
३. सर्व महानगरपालिका/नगरपालिका,
४. सर्व अधिक्षक अभियंता, सार्वजनिक बांधकाम मंडळ,
५. अधिक्षक अभियंता, दक्षता पथक (भरारी पथक) मंडळ, मुंबई.
६. सर्व अधिक्षक अभियंता, दक्षता व गुणनियंत्रण मंडळ.
७. सर्व कार्यकारी अभियंता, सार्वजनिक बांधकाम विभाग.
८. सर्व अधिकारी/कार्यासन अधिकारी, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई ३२.
९. कार्यासन रस्ते-१ (निवड नस्ती).

परिशिष्ट - १.१

INSPECTION

1.1 Minimum Frequency of Inspection of Roads

Sr. No	Type of road	Executive Engineer		Assistant Engineer		Junior Engineer	
		Routine	Special	Routine	Special	Routine	Special
1	N.H.,S.H., Municipal Roads, Artillery / Main Roads	Twice in a year (April & October)	Before and after monsoon	Once in two months, January, March, May, July, September, November & December	Before and after monsoon, Twice during rains	Once a month	Every fortnight during monsoon
2	M.D.R., O.D.R., Municipal Roads, Subsidiary Roads	Once a year	Before and after monsoon	Once in four months	Before and after monsoon once during rains	Once in two months	Every fortnight during monsoon
3	V.R.	Once a year		Once in six months	Before and after monsoon once during rains	Four times a year	Twice during monsoon

परिशिष्ट - १.२

1.2 Check List of Points To Be Examined During Inspection For Maintenance of Roads

Sr. No.	Item	Points to be examined
1	Safety	Safety at blockage / breaches / deep cuts / damaged culverts or bridge; horizontal and vertical clearance in respect of power lines, road side trees, guard rails, parapets etc.
2	Pavement	Magnitude and location of potholes, undulations, settlement, rutting pavement failures etc. along with their cause, camber and super elevation.
3	Shoulders & Embankment	Width and cross fall, side slopes, erosion, need for turfing or other protective measures.
4	Drainage	Adequacy of cross section, blockage, damage or siltation, need for lining etc.
5	Road furniture and road marking	Whether these are there, correctly located, need repairing (road furniture), clearing / repainting etc.
6	Protection work	The condition of retaining walls, parapet walls, drains, spouts, pitching on slopes etc.
7	Road side trees	Numbering of trees, disposal of dead trees etc.
8	Road Geometrics	Horizontal and Vertical Alignment, side distance at curves and intersections.
9	Additional points for hill roads	Condition of catch water / roadside drains, scuppers etc. need for new drains, safety measures, any danger of landslides, soil erosion, problems etc.
10	Road side materials	Whether aggregates and bitumen are stacked properly whether these obstruct safe traffic operations, whether the stacks are safe from inundation or washing away during the rains. These material shall be cover with polythin sheet
11	Encroachments	Encroachments, if any, and review action taken for their removal (Particularly the higher officer like S.E. / E.E. should take note of these during their inspections and ensure proper follow up action)
12	Quarries, Bench Marks etc.	These shall be inspected at least once annually by Sub Engineer and Assistant Engineer to check whether these are being maintained properly.

परिशिष्ट - १.३

1.3 Points To Be Looked For During Inspection and Action To Be Taken Prior To / During / After Rains.

Prior to rains	During rains	After rains
Cleaning / Clearing all drains, catch pits etc.	Have close watch on flood levels, desilting any tendency for overtopping and blockages of drains / culverts etc. and take timely action for rectification.	Assess the damage, give top priority for repairing bridges and removing blockages.
Repairing damages to all protective works like pitching etc.	Repairs potholes and keep road traffic worthy / motorable.	Watch for water oozing out of shoulders / slopes. If so cut out to release and remove the locked up water.
<p>Filling scour holes at abutment / pier of C.D. works</p> <p>Storing and protecting road construction materials safe from floods.</p> <p>Repaving / sealing pavement cracks, potholes etc.</p> <p>Dressing berms so that these easily shade off water</p> <p>Removing all loose material in cuttings, cleaning gutters and catch water drains.</p>	In case of any breach / landslide cordon of the affected stretch by barriers, arrange for traffic diversion, notify the public of the diversion, and take immediate action in making up the breach / landslide.	<p>Repair potholes / cracks etc.</p> <p>Study stretches showing recurring damage to ascertain causes and evolve remedial measures.</p>

परिशिष्ट – २.१

MAINTENANCE

2.1 Symptoms, Causes and Treatment of Defects in Bituminous Surfacing

Sr.No.	Symptoms	Type of Distress	Probable Causes	Possible Types of Treatment
A. Surface Defects -				
1	Fatty surface	Collection of binder on the surface.	Excessive binder in premix, spray of tack coat, loss of cover aggregates excessively heavy axle loads	Sand blinding : Open graded premix , liquid seal coat : burning of excess binder, removal of affected area
2	Smooth surface	Slippery	Polishing of aggregates under traffic or excessive binder	Resurfacing with surface dressing or premix carpet
3	Streaking	Presence of alternate lean and heavy lines of bitumen	Non uniform application of bitumen or at a low temperature	Application of new surface
4	Hungry Surface	Loss of aggregates or presence of fine cracks	Use of less bitumen or absorptive aggregates	Slurry seal or fog seal
5	Bleeding of asphalt	Slippery	Excess of asphalt while mixing	Sand blinding
B Cracks -				
1	Hair line cracks	Short and fine cracks at close intervals on the surface	Insufficient bitumen, excessive filler or improper compaction	Should be filled with a low viscosity binder or a slurry seal or fog seal depending on width of cracks. Unsound cracked pavements will need strengthening or rehabilitation treatment.

Sr.No.	Symptoms	Type of Distress	Probable Causes	Possible Types of Treatment
2	Longitudinal	Cracks on straight lines along the road	Poor drainage shoulder settlement, weak joint between spreads of pavement layers or different frost heave	Should be filed with a low viscosity binder or a slurry seal or fog seal depending on width of cracks.Unsound cracked pavements will need strengthening or rehabilitation treatment.
3	Edge cracks	Cracks near and parallel to pavement edge	Lack of support from shoulder, poor drainage, frost heave, or inadequate pavement width	Should be filed with a low viscosity binder or a slurry seal or fog seal depending on width of cracks. Unsound cracked pavements will need strengthening or rehabilitation treatment.
4	Shrinkage cracks	Cracks in transverse direction or inter connected cracks forming a series of large blocks	Shrinkage of bituminous layer with age	
5	Reflection cracks	Sympathetic cracks over joints and cracks in the pavement underneath	Due to joint and cracks in the pavement layers underneath	
C Deformation -				
1	Slippage	Formation of crescent shaped cracks pointing in the direction of the thrust of wheels	Unusual thrust of wheels on direction, lack of failure of bond between surface and lower pavement courses	Removal of surface layer in the affected area and replacement with fresh material
2	Rutting	Longitudinal depression in the wheel tracks	Heavy channelized traffic, in-adequate compaction of pavement layers, poor stability of pavement material and heavy bullock–cart traffic	Filling the depressions with premix material

Sr.No.	Symptoms	Type of Distress	Probable Causes	Possible Types of Treatment
3	Corrugations	Formation of regular undulations	Lack of stability in the mix oscillations set by vehicle springs, or faulty laying of surface course	Scarification and relaying of surfacing or cutting of high spots and filling of low spots
4	Shoving	Localized bulging of pavement surface along with crescent shaped cracks	Unstable mix, lack of bond between layers or heavy start – stop pipe movements and those involving negotiation of curves and gradients	Removing the material of firm base and relaying a stable mix
5	Shallow Depression	Localized shallow depressions	Presence of inadequately compacted pockets	Filling with premix materials
6	Settlement and up-heaval	Large deformation of pavement	Poor compaction of fills, poor drainage, inadequate pavement or frost heave	Where fill is weak, the defective fill should be excavated and redone, where inadequate pavement is the cause, the pavement should be strengthened
D Disintegration				
1	Stripping	Separation of bitumen aggregate in the presence of moisture	Use of hydrophilic aggregate, inadequate mix composition continuous contact with water, poor bond between binder and aggregate, poor compaction etc.	Spreading and compacting heated sand over the affected area in the case of surface dressing replacement with fresh bituminous mix with added antistripping agent in other cases

Sr.No.	Symptoms	Type of Distress	Probable Causes	Possible Types of Treatment
2	Loss of aggregate	Rough surface with loss of aggregate in some portions	Ageing and hardening of binder, stripping, poor bond between binder and aggregate, insufficient binder, brittleness of binder etc.	Application of liquid seal, fog seal or slurry seal depending on the extent of damage
3	Raveling	Failure of binder to hold the aggregate shown up by pock marks or eroded areas on the surface.	Poor compaction, poor bond between binder and aggregate, insufficient binder, brittleness of binder etc.	Application of cut back covered with coarse sand, slurry seal or premix renewal coat.
4	Pot holes	Appearance of bowl shaped holes, usually after rain.	Ingress of water into pavement, lack of bond between the surface and W.B.M. base, insufficient bitumen content etc.	Filling pot holes with premix material or penetration patching.
5	Edge breaking	Irregular breaker of pavement edges	Water infiltration, poor lateral support from shoulders inadequate strength of pavement edges etc.	Cutting the affected area to regular section and rebuilding with simultaneous attention paid to proper construction of shoulders

परिशिष्ट — २.२

2.2 Time schedule for maintenance of different types of Roads

Types of roads under maintenance are –

- 1) Concrete Roads
- 2) Asphalt/Mastic Roads
- 3) Water Bound Macadam Roads &
- 4) Moorum Roads
- 5) Inerlocking concreete paver block roads
- 6) Thin or Ultra-Thin white topping roads.

The following time schedule should be followed.

Sr.No.	Type of Road	Nature of Repairs	Time Schedule
1	Concrete/Thin or Ultra-Thin White topping roads	Filling cracks and potholes in c.c. pavement and reinstalling expansion joints with asphalt mastic and covering worn – out portion with thin carpet.	October and November every year and in March – April as per the need.
2	Asphalt /Mastic/Paver blocks Raods	Covering worn out portion with asphalt overlay and filling potholes with asphalt cold mix during dry spell. Incase of paver blocks, maintaining proper slope and repairing any undulations due to trenching activity	August and November every year and in March – April as per the need.
3	W.B.M. Roads	a) Collection of material for patch repairs. b) Filling potholes. c) Picking loose metal and spreading blindage.	April to June June to October All the year round.
4	Moorum Road	Filling potholes and dressing the road surface	All the year round specially after monsoon.
5	Items common to all types of roads	a) Filling edges, dressing side slope and keeping the road edges trimmed, b) Clearing the berm of shrubs and grass. c) Trimming of branches of road side trees. d) White washing guard stones, trees and painting Kilometer stones, sign boards, numbering C.D. Works etc.	All the year round. All the year round. October to December October to December

Sr.No.	Type of Road	Nature of Repairs	Time Schedule
		<p>e) Repair to C.D. Works such as repairs to masonry, clearing waterway, removing bushes from the masonry etc.</p> <p>f) Putting water table, clearing road side gutters and catch water gutters.</p> <p>g) Removing water tables.</p>	<p>May and June before monsoon. November and December after monsoon.</p> <p>April to June.</p> <p>October to November.</p>
		<p>h) Planting arboriculture</p> <p>i) Watering new plantation</p> <p>j) Fixing / re-fixing guard stones, boundary stones, indicator stones, sign boards.</p> <p>k) Strip painting i.e. center line of two lane roads.</p>	<p>July to August.</p> <p>January to June.</p> <p>As per the need.</p> <p>May & November.</p>
6	Bridges	<p>a) Inspection of bridges, bearings. All bridge bearings and condition of superstructure should be inspected closely in detail (with help of binoculars and hangers etc. if necessary)</p> <p>b) Removal of railing over submersible bridges.</p> <p>c) Re-fixing of railing over submersible bridges.</p> <p>d) Removal of plants or unwanted growth of shrubs including poisoning of roots and branches of trees and to be trimmed.</p> <p>e) Painting of parapets and Krebs</p>	<p>May & November.</p> <p>June.</p> <p>November.</p> <p>November to December.</p> <p>November to December</p>
7	Programme for B.T. Renewal	<p>a) Finalization of programme for next financial year,</p> <p>b) Sanction for S.R. Estimates.</p> <p>c) Calling tender and fixing agencies</p> <p>d) Execution of S.R. Programme</p>	<p>January</p> <p>February to March</p> <p>March onwards</p>

Sr.No.	Type of Road	Nature of Repairs	Time Schedule
8	Programme of W.B.M. Renewal	a) Programme of next year b) Sanction for S.R. Estimates c) Calling tender and fixing agencies d) Execution of S.R. Programme	January February to March March to April June to November

परिशिष्ट — २.३

2.3 Maintenance Criteria of the Road

Sr.No.	Feature	Criteria	Action	Priority
A Feature concerned with safety of traffic. -				
A-1	Major breaches in the roadway	Any type of breach which endangers safety of traffic and causes obstructions to flow of traffic	Steps to be taken as listed in Annexure-XV (Action to be taken in case the Road is Breached or Blocked)	Urgent
A-2	Minor cuts, ruts or blockades	Cuts or blockades which do not completely obstruct the traffic but endanger safety of traffic	Get blockades removed and get the cuts repaired	Urgent
A-3	Branches of trees at height less than 4.5m. over the roadway	Any kind	Get them cut in order of lower once first	Special attention
A-4	Improvements to accident prone spots and location requiring geometric improvement sight distance etc.	Any kind	Identify such locations, prepare estimate and take up works annually according to relative priority and availability of funds	According to relative priority
B Carriageway and crust conditions				
B-1	Cracking not accompanied by rutting	a) Cracking in local areas equal to or less than 25 percent of the total area b) Cracking in large areas exceeding 25 percent of the total area	Local sealing or filling of the cracks – a) Binder @ 1.5 kg/m ² . of bitumen emulsion or 1.5 kg/m ² of cut back for local sealing b) Chipping (6 to 10 mm) for local surfacing repairs needs surfacing after local sealing	Routine Special Attention

Sr.No.	Feature	Criteria	Action	Priority
B-2	Stripping	a) In local areas exceeding 25 percent of the total area	Apply local sealing	Routine
		b) Any long area exceeding 25 percent of the total area	Apply surface dressing	Special Attention
B-3	Bleeding	a) In local areas exceeding 25 percent of the total area	Spread and roll over 6mm size aggregate, heated to 60 ⁰ C.	Routine
		b) Any long area exceeding 25 percent of the total area	Same as above and if necessary apply surface dressing after bleeding has stopped.	Special Attention
B-4	Rutting	a) Less than 50 mm accompanied by cracking of less than or equal to 10 m/m ²	Applying coat at 0.5 kg/m ² and fill bituminous mix using rake and leaving an excess thickness of about one third the depth of rut. Compacting surfaces level and local sealing of cracks	Rutting
		b) Less than 50 mm accompanied by cracking of more than 10 m/m ²	As above.	Special attention
		c) More than 50 mm accompanied by cracking of more than 10 m/m ²	With surface dressing over cracks overlay required	Work of original nature.
B-5	Pot-Holes	Pot holes as soon as they appear	Local restoration by patching /overlay	Special Attention

Sr.No.	Feature	Criteria	Action	Priority
B-6	Reflection cracks	a) Widely spaced cracks b) Closely spaced cracks	Seals Apply surface dressing	Recurrent Special attention.
B-7	Edge subsidence and rutting	Any extent	Patch road edge and repair shoulder	Recurrent
B-8	Defective camber	Any extent	Check and correct by reconstructing to proper camber profile	Special Attention
B-9	Undulations	Any extent	Investigate the cause and rectify	As above
B-10	Loss of material from unpaved road	Any extent	Do re-gravelling	As above
C Shoulders – side drains-				
C-1	Deformation or scour of shoulders	Any extent	Fill and compact and bring its surface to desired camber.	Routine
C-2	Silting of side drains	As above	Clean out the drains	As above
C-3	damage of scouring of drain	As above	Reconstruct to adequate shape and size	Special attention
D C. D. Works-				
D-1	Causeways			
	a) Pot holes in paved surface	As above	Repair by filling	Special attention
	b)Erosion at inlet / outlet	As above	Repair	As above
	c) Guide post flood gauge missing	Any extent	Repair / Replace	As above
D-2	Culverts			
	a) Silting	Any extent	Desilting	Special attention
	b)Erosion at inlet / outlet	As above	Repairs	As above
	c)Settlement Cracks	As above	Repairs	As above
E Other Works -				
E-1	Road furniture and wearing dirty or corroded or damaged missing	Any extent	Clean, repair and replace	Routine
E-2	Missing road signs including those at accident prone spots on location of substandard geometric/ standards	Any extent	Fix new one	Special attention

Sr.No.	Feature	Criteria	Action	Priority
E-3	speed Breakers / Rumbling strips	Any extent	Maintain in a proper shape and geometry and install warning signs.	As above

Note- Whenever repairs are undertaken for any stretch of road, adequate attention needs to be paid to proper parking of machinery on the road side after a day's work, exhibition of road signs in stretch etc. to control the traffic during execution for avoiding accidents, especially during the night time including warning lights at night. The temporary diversion for traffic, if necessary should be of proper standard for the intensity of traffic and should be provided with adequate signs, lights road marking stones / railing etc. (Refer figure 11.1 of pocket book for highway engineers. I.R.C. 1983.

परिशिष्ट — ३.१

Road Maintenance –Specification (Reproduced from MORTH “Specification for Road and Bridge works”)

3.1 Section 3000 Maintenance of Road

3001 GENERAL

The Specifications shall apply to all items of road maintenance works as required to be carried out under the Contract or as directed by the Engineer. The works shall be carried out in conformity with the relevant Specifications to the required level, grade and lines using approved materials. The works shall be carried out using appropriate machinery. Wherever the Specifications are not given for an item, sound engineering practice shall be adopted to the satisfaction of the Engineer.

3002 RESTORATION OF RAIN CUTS

3002.1 Scope

The work shall consist of earthwork for restoration of rain cuts in the embankment and shoulders, using suitable material, and compacting the same.

3002.2 Materials

The material used for restoration of rain cuts shall consist of soil conforming to Clause 305.2.

3002.3 Construction Operation

The area affected by rain cuts shall be cleared of all loose soil and benched. The width of the benches shall be at least 300 mm and they shall extend continuously for a sufficient length. The height of the benches shall be in the range of 150-300 mm.

Fresh material shall be deposited in layers not exceeding 250 mm loose thickness and compacted so as to match with the benching at moisture content close to the optimum. Compaction shall be carried out using suitable equipment such as plate compactors and rammers or by suitable implements handled manually. The finished work shall conform to alignment, levels and slopes as indicated in the drawing or as directed by the Engineer.

3002.4 Measurements for Payment

The earthwork for restoration of rain cuts shall be measured in cubic metres.

3002.5 Rate

The Contract rate for the item of earthwork for restoration of rain cuts shall be payment in full for carrying out the required operation including full compensation for:

- i) Supply of labour, equipment and material including all leads and lifts and the cost of arranging land for borrow pits;
- ii) Setting out;
- iii) Removal of loose material from the rain cuts;

- iv) Benching of old earthwork; and
- v) Compacting after adding required quantity of water.

3003 MAINTENANCE OF EARTHEN SHOULDER

3003.1 Scope

The work of maintenance of earthen shoulder shall include making up the irregularities/loss of material on shoulder to the design level and cross-fall by adding fresh approved soil and compacting it with appropriate equipment or to strip excess soil from the shoulder surface as per the requirement of these Specifications.

3003.2 Material

The material to be added to the shoulder, if required, shall be a select soil conforming to Clause 305.

3003.3 Construction Procedure

This work shall involve:

- i) Making up of the earthen shoulder by adding extra soil and compacting the same; and/or
- ii) Stripping a layer of soil to achieve the required grade and level.

Wherever extra earth is required to be added, the earthen shoulder shall be stripped and loosened to receive fresh soil. The deficiency of thickness shall be made up in layers of loose thickness not exceeding 250 mm. Water shall be added, if required, to attain the optimum amount and the layer compacted by a smooth wheel roller, vibratory roller, hand roller, plate vibrator or hand rammer to obtain at least 97 percent of the maximum dry density in accordance with IS:2720 (Part 8). The finished surface shall have the specified cross slope and line in accordance with the drawing or as directed by the Engineer. The side slopes shall be trimmed to the required slope with the help of grader or manual methods using hand tools.

Wherever the earth is required to be stripped from the shoulder, this shall be done either using equipment like grader or by manual means using hand tools. The resulting surface shall be uniform and have a field density of atleast 97 percent of maximum density obtained in accordance with IS:2720 (Part 8). If the surface is not uniformly compacted, it shall be excavated to a depth of 150 mm and the soil mixed with water if required and compacted at a moisture content close to the optimum to achieve 97 percent of maximum density as stated above.

3003.4 Measurement for Payment

Maintenance of earthen shoulder shall be measured in sq.metres.

3003.5 Rate

The Contract unit rate for maintenance of earthen shoulder shall be payment in full compensation for :

- i) Furnishing earth required for making up of shoulders including all leads and lifts, compaction to the required density and cost of arranging land for borrow pits;
- ii) Excavation and stripping of earth as required and disposal of the earth at the location approved; and
- iii) All labour, tools, equipment and incidentals to complete the work in accordance with these Specifications.

3004 BITUMINOUS WORK IN CONNECTION WITH MAINTENANCE AND REPAIR

3004.1 General

The scope and type of maintenance work to be carried out shall be in accordance with the provisions of the Contract or as instructed by the Engineer.

Maintenance treatments required under the Contract or instructed by the Engineer may include pothole and patch repair, crack-sealing, fog spray, dusting, slurry sealing, surface dressing, overlays and specialist repairs.

The materials (particularly patching and overlay materials) used in maintenance operations shall be of a standard not less than those specified for the original construction.

Traffic control during maintenance operations shall conform to the requirements of the Contract and Section 100.

3004.2 Filling potholes and Patch Repairs.

3004.2.1 Scope.

This work shall include repair of Potholes and Patching of all types of bituminous pavement and paved shoulders.

The work shall include the removal of all failed material in the pavement courses are necessary, below the pavement until the root cause of the failure is removed the of the completed excavation to provide firm vertical faces the replacement of material of at least as high a standard as that which was originally specified for the pavement laying the application of tack coat on to the sides and base of excavations prior to placing of and bituminous material and the compactions trimming and finishing of the surface of all patches to form a smooth continuous surface level with the surrounding road,

3004.2.2 Materials.

All material used for the pothole and patch repair of bituminous surface and underlying layers shall be in accordance with these specifications and shall be of the same type as specified for the original construction. A mix superior to the one on the existing surface may also be used for repair work. An emulsified bitumen/modified bitumen mix compatible with the existing layer shall also be considered appropriate.

Material used for patching shall not be of lesser bearing capacity not of a greater than the adjacent previous construction. Non bituminous material shall not used patching bituminous materials.

Ready patch mix material can also be used with the specific approval of the Engineer.

3004.2.3 Preparation of the Area for Pothole and Patch Repair.

Each pothole and patch repair area shall be inspected and all loose and defective material removed. The area shall be cut/trimmed to a regular shape either with jack hammers or with hand tools suitable for the purpose.

The edges of the excavation shall be vertically. The area shall be thoroughly cleaned compressed air or any appropriate method approved by the Engineer to remove all dust and loose particles.. Layers below the level of the bituminous construction shall be filled using material of the equivalent specification to the original construction, which shall particular include the specified standards of compaction. The area and side for bituminous construction shall be applied with a tack coat confirming to clause 503 of these Specifications.

3004.2.4 Backfilling operation.

The mixture to be used in bituminous patching shall be either a hot mix or a cold mix in accordance with the appropriate clauses of these specification or any other approved patching material . Mixing shall be done in a plant of suitable capacity. The bituminous mixture shall be place in layer of thickness not more than 100mm (loose) and shall be compacted in layers with roller / plate compactor/hand roller / rammer to the compaction standards defined in the appropriate clauses of these specification. While placing final layer, the mix shall be spread slightly proud of the surface so that after rolling the surface shall be flush with the adjoining surface. If the area is large the spreading and levelling shall be done using appropriate tools and equipment. During the process of compaction, the surface level shall be checked using a 3 m straight edge.

3004.2.5 Measurement for Payment.

Filling of potholes and patch repair shall be measured in sq.m or by weight in tones.

3004.2.6 Rate.

The contact unit rate for filling of potholes and patch repair shall be payment in full for :

- i) Furnishing all material required.
- ii) All work involved including excavation trimming filling with any non bituminous layers required , applying tack coat, and back filling with bituminous material.
- iii) All labour, tools equipment and incidentals to complete the work in accordance with the specifications.

3004.3 Crack sealing.

3004.3.1 General

Crack sealing shall consist of one or more of the following operations as instructed under the contract :

- i) fog seal.
- ii) filling cracks with a binder or a combination of crusher dust and a binder.
- iii) by treating the crack sealing as a patch repair.

3004.3.2 Fog seal.

3004.3.2.1 Scope

Fog seal for use in maintenance work shall confirm to the requirements of clause 513 of these specifications and shall consist of an application of emulsified bitumen without any aggregate cover for sealing fine hair cracks or for rejuvenating oxidized bituminous surface. Areas having cracks with less than 3mm width shall be considered for this treatment unless otherwise instructed by the Engineer.

4004.3.2.2 Material

Bituminous emulsion for fog seal shall be confirmed to the requirements of clause 513 of these specifications.

3004.3.2.3 Application

The area to be treated with fog seal shall be thoroughly cleaned with compressed air and scrubbers, etc. The cracks shall be cleaned with a compressed air jet to remove all dirt, dust, etc. The fog seal shall be applied at the rate of 0.5 – 0.1 litre/sq.m of emulsion or as otherwise instructed by the Engineer, using equipment such as a pressure tank, flexible hose and spraying bar or lance. Traffic shall be allowed on to the surface only after the seal has set to a non tacky and firm condition so that it is not picked up by the traffic.

3004.3.2.4 Measurement for payment.

The fog seal work shall be measured in sq.mts. calculated from the dimensions of work instructed in the contract or by the Engineer.

3004.3.2.5 Rate

The contract unit rate for application of fog seal shall be payment in full for :

- i) Supplying of fog seal material and all the operations for applying and
- ii) all the labour, tools, equipment and incidentals to complete the work accordance with these Specifications.

3004.3.3 Crack filling

3004.3.3.1 Scope

Crack filling shall be carried out using a binder of a suitable viscosity, normally a slow bitumen emulsion as instructed by the Engineer for wider cracks in excess of an average of 3 mm in width, the application of emulsion shall be preceded by an application of dust or other fine material or a suitable premix acceptable to the Engineer.

3004.3.3.2 Material

Bitumen for use in crack sealing shall be of a slow curing type as instructed by the Engineer. Dust for crack sealing when used shall be crusher dust or some other suitable fine material approved by the Engineer, passing the 2.36mm sieve but with a maximum of 10 percent passing the 0.075mm sieve.

3004.3.3.3 Construction.

If crusher dust or other graded fine material is to be used it shall be placed in the cracks before the application of binder and the cracked filled to a level approximately 5mm below road surface level. The surface of the road shall be swept clear of dust prior to the application of binder or premix. Binder shall be poured into the cracks, taking care to minimize spillage. If spillage onto the road surface does occur, dust shall be applied to the excess bitumen until it is blotted up. Where a crack-filling mix is used, a squeegee shall be used to force the premix into the cracks wider than 10 mm.

3004.3.3.4 Measurement

The work of crack sealing in areas where patching is to be done subsequently shall be measured in sq.m. Isolated cracks where no patching is to be done subsequently shall be measured in linear metre.

3004.3.3.5 Rate

The contract unit rate for crack sealing shall be payment in full for :

- i) Supplying all necessary materials and for the work of applying them;
- ii) All labour, tools, equipment and all incidentals necessary to complete the work according to these Specifications.

3004.3.4 Crack Prevention Courses

Where specified crack prevention courses shall conform to Clause 517.

3004.4 Dusting

3004.4.1 Scope

Dusting shall consist of the application of crusher dust or other fine graded material approved by the Engineer to areas of road where bleeding of excess bitumen is occurring.

3004.4.2 Material

Dust shall consist of crusher dust or other graded fine material acceptable to the Engineer, and shall generally be finer than 2.36 mm with not more than 10 percent passing the 0.075 mm sieve.

3004.4.3

Dust shall be spread by manual application, to the areas of road defined by the Engineer. Dust shall generally be applied during the hottest part of the day and, when so instructed by the Engineer, surplus dust displaced by passing traffic shall be manually swept back onto the area where further bleeding of excess bitumen is apparent. Dust shall be applied at a nominal rate of 2.5 kg. per square meter.

3004.4.4 Measurement

Dusting shall be paid for by the square metre of road surface instructed to be dusted by the Engineer.

3004.4.5 Payment

The Contract unit rate for during shall be payment in full for:

- i) Supplying all necessary material and for the work of applying them;
- ii) All labour, tools, equipment and all incidentals necessary to complete the work according to the Specifications.

3004.5 Slurry Seal

Slurry seal for use in maintenance work shall conform to the requirements of Clause 512.

3004.6 Surface Dressing for Maintenance Work

Surface dressing for maintenance applications shall be carried out in conformity with the requirements of **Clause 509**, except that the use of small and portable equipment shall be permitted provided that it can be demonstrated, to the satisfaction of the Engineer, that it can produce work consistently in accordance with the requirements of these Specifications.

3004.7 Special Treatments

3004.7.1 Special treatments include repairs of localized areas of damage to materials for which repairs using normal hot-mix or cold-mix patching materials are inappropriate. Such special treatments will include repairs to mastic asphalt and stone matrix asphalt.

3004.7.2 In such cases, pothole and patch repairs shall be carried out in accordance with the provisions of Clause 3004.2 above, except that the treatment to the mastic asphalt, stone mastic asphalt or other special material layer shall be carried out in accordance with the provisions of the appropriate Clauses of these Specifications.

3005 MAINTENANCE OF CEMENT CONCRETE ROAD

3005.1 Repair of Joint Grooves with Epoxy Mortar or Epoxy Concrete

3005.1.1 Scope

The work shall consist of repair of spalled joint grooves of contraction joints, longitudinal joints and expansion joints in a concrete pavement using epoxy mortar or epoxy concrete.

3005.1.2 Materials

The type/grade of epoxy compatible with the coefficient of thermal expansion of concrete shall be used with either processed fine aggregate or fine stone chips to produce a dry mix for repairing spalled or damaged edges.

3005.1.3 Repairing Procedure

Spalled or broken edges shall be shaped neatly with a vertical cut with chisels into the shape of rectangle. Small pneumatic chisels also may be used, provided the cutting depth can be controlled. The depth of the cut shall be the minimum to effect repair. After shaping the spalled area, it shall be cleaned and primed. The epoxy mortar/concrete is then applied using hand tools like trowels, straight edges, brushes etc. The repaired edge shall be in line with the joint groove and shall be flush with the concrete slabs. During the repair work, any damage noticed to the joint sealant shall be made good by raking out the affected portion and resealing.

3005.1.4 Traffic

Although the epoxy mixes set in 2-3 hours time, it is desirable to divert the traffic for 12 hours or as per the recommendation of the manufacturer.

3005.1.5 Measurements for Payment

Repair of joint grooves shall be measured in linear meters.

3005.1.6 Rate

The Contract unit rate for repair of joint grooves with epoxy mortar or epoxy concrete shall be in full compensation for :

- i) Supply and application of epoxy primer, epoxy mortar or epoxy concrete;
- ii) All tools, equipment and incidentals to complete the work in accordance with the Specifications.

3005.2 Repair Involving Removal of Old Joint Sealant and Sealing with Fresh Sealant in Cement Concrete Pavements

3005.2.1 Scope

The repair of sealant of contraction, longitudinal or expansion joints shall include removal of the existing sealant and resealing the joint with fresh sealant material.

3005.2.2 Material

Sealant material to be replaced shall be either hot poured rubberized bitumen or cold-poured polysulphide or silicone sealant as per Clause 602.2.10. As per the recommendation of the manufacturer, appropriate type of primer shall be applied.

3005.2.3 Repairing procedure

The existing sealant shall be raked out with the help of a metal raker such that most of the sealant is removed. Subsequently, the sealant stuck to the sides of the grooves shall be removed thoroughly either by using saw cutting machine so that grooves may be widened by 1 mm or by sand blasting. In no case the old sealant shall be present during resealing operation. If joint grooves are found inadequate in depth, they shall be deepened as directed by the Engineer. The edges of the groove shall be chamfered. Any spalls of the joint shall be made good by epoxy mortar.

Before commencing the sealing operation, compressed air shall be used to clean the joint grooves. A heat resistant, paper backed compressible debonding strip or tape and backer rod should be inserted in accordance with the requirement of Clause 602.10.2. Sealant may be poured either using hand held pourer or using mechanized sealing machines. Sealants should not be heated directly but in double jacketed machine. All precautions and arrangements shall be taken not to spill the sealant on the concrete pavement. The sealant may be poured to a depth of 3 mm from the pavement surface.

3005.2.4 Measurements for Payment

Repair of joint sealant shall be measured in linear meters.

3005.2.5 Rate

Contract unit rate for repair of joint sealant shall be in full compensation for

- a) Removal of old sealant, regrooving or sand blasting the sealing groove and placing of debonding strip or tape.
- b) All tools, equipments and incidentals to complete the work in accordance with the Specifications.

परिशिष्ट - ४.१

4.1 Modern Techniques For Maintenance of Roads

IRC81, 82 of 2015 in section-11 deals with various modern machinery and techniques available for mechanized maintenance of roads. Many such machines are available under different brands as given below:

1. Jet Patcher
2. Infrared
3. Emulsion cod mix pitcher
4. Mobile Maintenance Van
5. Australian Maintenance Unit
6. Patching Unit of British Company
7. Swedish Machine
8. Termac Recycling System
9. Global Sweeping Python 5000 – Patching Machine
10. Speedcrafts Pothole Repairing Machine

All the above machines are from foreign countries. They need specialized trained operators as well spares which are not available in India and therefore, it is seen that such Units become unavailable for maintenance or remain idle for want of spare parts or non-availability of specially trained operators. Committee, therefore, recommends instead of going in for such modern machinery, a typical Jet patching velocity spray injection patch unit, Mobile mechanized maintenance unit bought by MCGM for localized application as roads in Mumbai have heavy traffic. Mechanized Maintenance Unit will be time saving and beneficial to the commuters in densely populated urban areas. Table 4.8.1 below gives details of modern machinery available.

IRC-82: 2015 also deals with methodology of Pavement Condition Survey. The same is described below (Page No.66 to 72 depicted here as it is).

परिशिष्ट - ५

5.1 The material available for immediate repairs of bituminous pavement are enlisted below :

1. Mastic grout
2. Emulsion
3. Nu-Phalt Infra Red Pothole Recycling System
4. Renolith Based Technology Instamix
5. Zycosoil Nanotechnoloty.
6. Rhinophalt
7. INSSTA PATTCH/Wonder Patch
8. Shell Mac PR
9. FAST PATCH DPR Pourable Asphalt Repair
10. EZ Street cold asphalt
11. Perma-Patch
12. PENNDOT 486
13. Q.P.R. 2000




carbon core



All these products available in the market are to be used in case of emergency for temporary repairing works. They are basically rapid setting cement or emulsion base mix which is poured in the pot holes and compaction is done by grouting or by roller and major pot hole distress is removed and thereby relief is given to commuters. However, these asphalt patch material are also foreign based and, therefore their use needs to be studied before use as reference code of practice. Also shelf life and prohibitive cost of these materials make it impossible to use in Indian conditions. However, in high density corridor roads or in hilly areas, immediate restoration is the need of hour. Use of such products like Instamix-PR or Fasti Grout may also be tried for localized comfort during heavy traffic in Ganesh Festival or heavy down pouring in Mumbai areas. Table below gives the details of modern materials available.



SECTION – IV (A)


MODERN MACHINERY

Modern Pot Hole Filling Machinery Information

Sr. No.	Name of Machinery	Image	Country	Cost of Machinery	Use	Advantages	Disadvantages	Remarks For use in Indian Condition
1.	Tarmac recycling System - Infrared Tarmac Heater is used.		India – N.Delhi, Also in US, UK	Rs.1.5 – 2.00 cr approx.	Pothole Filling recycling of asphalt	1. This system need only two persons with a van and 22 minutes to repair pothole (1 Sq.m.) 2. Recycling of asphalt. 3. Cost savings upto 40%. 4. Lasts longer.	Cost of Electrical heating, Maintenance	Has been recommended by IRC
2.	Global Sweeping Python 5000 – Pothole patching machine		United States	Rs.1.92 Cr.	Pothole Patching	1. Self propelled, 2. One person can easily do the entire operation	Training needed.Cost if to be imported	Non-availability of Spare parts
3.	ESUN CPB-4000 Pothole patching Machine		China	Rs.50.00 lakh without truck. And 77 lakhs with truck mounted (excluding import duty)	Pothole Patching	1. User friendly due to adjusted boom. 2. Takes 5 min to patch one sq.m. of pothole 3. Low maintenance	Cost high if to be imported	Non-availability of Spare parts

Sr. No.	Name of Machinery	Image	Country	Cost of Machinery	Use	Advantages	Disadvantages	Remarks For use in Indian Condition
4.	CLYB – CYL 1000 Asphalt patching Truck, Includes Truck asphalt tank, heater, aggregate bin, roller, etc.		China	Rs.42.00 lakh without truck. And 53.72 lakhs with truck mounted (ex cluding import duty)	Pothole Patching	1. Intelligent heating control device 2. Mounted on truck for fast response to pothole filling	Cost high if to be imported	Non-availability of Spare parts
5.	Speedcrafts Pothole repairing machine mounted on TATA 1613 truck chassis.		India-has been used in Banglore	Rs.42.00 lakh with truck. And 30.00 lakhs without truck.	Pothole Patching	1. All equipments and material related to pothole repairs are mounted on a single truck. 2. Less labour required 3. Has 100 Sq.m. of working area.	Is for Emulsion based bitumen.	Compatible to Indian Standards. Need to Customise for Bitumen application

Sr. No.	Name of Machinery	Image	Country	Cost of Machinery	Use	Advantages	Disadvantages	Remarks For use in Indian Condition
6.	Pothole patcher with front Boom		United Kingdom	Rs.2.00 Cr.	Pothole Patching	<p>1. The machine has a robotic arm, which extends from the cab over the pothole and fills it with material to fill in the crater.</p> <p>2. A driver can control the process from inside the vehicle's cab, using a computer-style joystick.</p> <p>3. It takes just two minutes to fill in a pothole.</p>	Training driver needed, cost high if to be imported	Non-availability of Spare parts.
7.	Dura Truck		United States		Pothole Patching	<p>Truck mounted patcher</p> <p>Vent-Flo Nozzle</p> <p>Ergonomic Nostress Boom</p> <p>6 yd aggregate hopper</p> <p>Heated Emulsion Tank</p>		

Sr. No.	Name of Machinery	Image	Country	Cost of Machinery	Use	Advantages	Disadvantages	Remarks For use in Indian Condition
8.	Dura Maxx – Pothole Patching with Boom in front		United States		Pothole Patching	In-cab operation Vent-Flo Nozzle Truck mounted convenience 5 yd aggregate hopper Heated Emulsion Tank		

परिशिष्ट - ६

6.1 Special points squiring attention for roads in hilly terrain (Ghat roads)

1. Drainage

It is essential to provide adequate and efficient drainage of rain water flowing on the road from the upper areas. For this purpose, the following should be ensured:-

- (a) Provision of catch water drains above the cut slopes and ensuring their proper maintenance.
- (b) Maintenance of side drains for effective drainage and removing blockages (drains may be lined where erosion is anticipated. They may also be covered temporarily during rainy season by wooden ballies where they are likely to get choked with sliding material) and cleaning the catch pits of upstream of the culverts.
- (c) Provision of drains or bunds by the side of choked drains to channelize the water which would otherwise flow across road surface.
- (d) Provision of adequate holes in the retaining walls.
- (e) Cleaning of drains and weep holes before onset of monsoon.

2. Soil Erosion

Erosion near culverts can be prevented by suitable channel training and provision of paving/pitching and provision of outfall points, drop, walls, apron, etc. vegetative covers should be provided on the cuts/hills for erosion control.

3. Landslides

Landslide problems can be minimized by the following measures:-

- (a) Providing the side slopes to the proper stable angle.
- (b) Identification of all potential disturbed slopes and providing suitable treatment.
- (c) Avoiding indiscriminate blasting near about.
- (d) Providing protective structures like chock walls/breast walls/toe walls.

परिशिष्ट - ७

Trenching work, Trenchless Technology & Reinstatement.

Pipelines/cables of almost all utilities are laid underground, generally below the road surface which may include the carriage way or the footpaths. By virtue of increase in population and living standards, the demand for services, has not only just increased but the citizens, also expect better quality and prompt services from the Municipal Corporation State Govt. and all other service providers. The services with pipelines or cables laid underground are basically Water supply, Drainage, Electric supply, Telecommunications, Gas line, CCTV etc. These services have caused great congestion below the road surface due to which laying of new pipeline or cables has become difficult and the occurrence of faults, requiring excavation for carrying out repairs, has increased. For laying of new pipelines/cables as well as for repairing faults, the concerned utility agency repeatedly seeks emergency permission from Road department. However, on completion of laying pipelines/cables or after the fault is repaired, it becomes the responsibility of the Corporation State Govt. organization to bring the excavated surface back to its original status. To do this, the Corporation State Govt. organization recovers the costs from the concerned utility, but it is observed that repairing does not bring the surface of the road or the footpath to its original status or in tune with the surroundings. Inconvenience is caused to the public, as the reinstatement and restoration cannot be done immediately. This is not only because of the technical deficiencies while carrying out the work, but also due to a number of other limitations like reinstatement of only excavated area, delay in reinstatement, communication gap between Utility agency and the Corporation State Govt. organization or between various Departments of the Corporation.

The main problem observed during such works is enforcing the different conditions laid down at various stages for trenching and the reinstatement. There are specific tender conditions for protection of trench, lighting and providing safety to road users. But, these conditions are not fulfilled properly. At many places, heaps of earth (rubble, material, pipes etc) are seen lying on both sides of trenches for many days, creating problems for all pedestrians and vehicles. Hence, it is absolutely essential, to enforce the discipline by strict supervision and thorough penal action. The other inherent defect is in the backfilling process and materials used. These problem can be tackled by substituting Granular or other suitable material for entire backfill and compaction of pavement by vibratory rollers as per requirements (small size equipment/ compactors required) .

Use of Trench less Technology

Use of Modern day techniques of trench less digging is an important solution for the problems faced for trench repairs. Techniques for Utility line installation, replacement, rehabilitation, inspection, location and leak detection are available in the market. These technologies require minimum digging at the ground surface.

Benefits of Trench less digging are as follows:

- 1.Safer for the public.
- 2.Minimal traffic impacts.
- 3.Minimal road repairs.
- 4.It reduces damages to valuable road surface.
- 5.It reduces the danger of improperly compacted excavation.
- 6.It saves resources and thus environmental degradation.
- 7.It reduces noise pollution.
- 8.It avoids annoyance to the public.

New Trench less Construction Methods

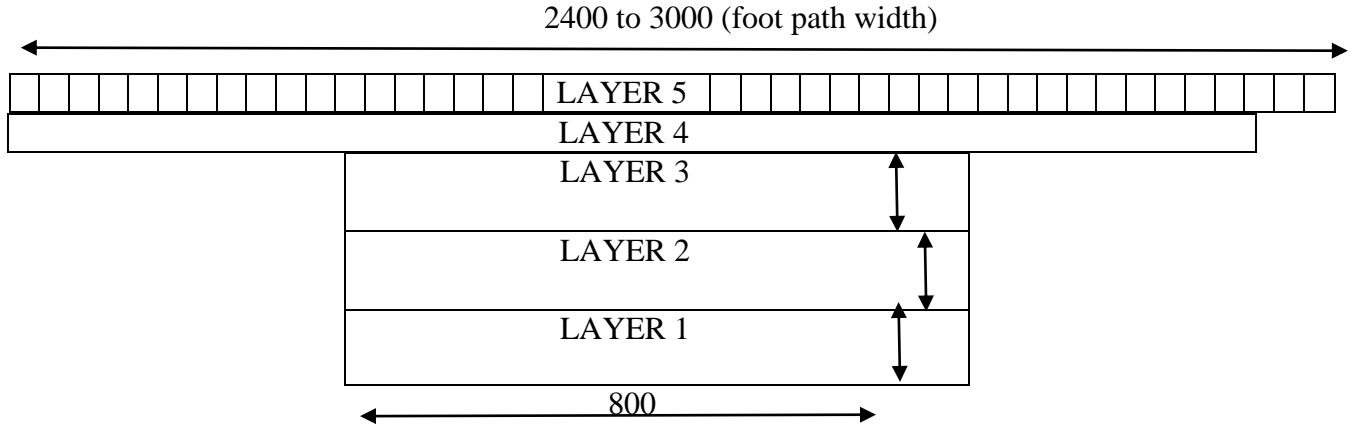
1. Impact Moiling.
2. Pipe ramming.
3. Auger Boring.
4. Pilot Tube.
5. Pipe Jacking.
6. Micro-tunneling.
7. Horizontal Directional Drilling.

Methods of reinstatement of trenches

- 1) On Laying of services it shall be properly covered and secured with tiles and/ or granular material by the utility. The thickness of such covering shall be sufficient so that while compaction of granular material and reinstatement of trenches the services laid should not get damaged.
- 2) The reinstatement contractor shall fill the trench with the granular layers. Each layer of granular material shall not be more than 150 mm in thick. Sufficient watering and ramming of each layer shall be done to avoid settlement of trench in future.
- 3) Over the layers of granular material, further reinstatement shall be done as per Annexure- 1,2 & 3 as directed.
- 4) All reinstatement work including Asphaltting shall be completed prior to 10th May.

Annexure – 1

TYPICAL CROSS SECTION OF TRENCH FOR REINSTATEMENT OF FOOTPATH / PASSAGE



(ALL DIMENTIONS ARE IN MM)

LAYER WISE DETAILS OF ITEM / MATERIALS TO BE USED AND ITS COMPACTION

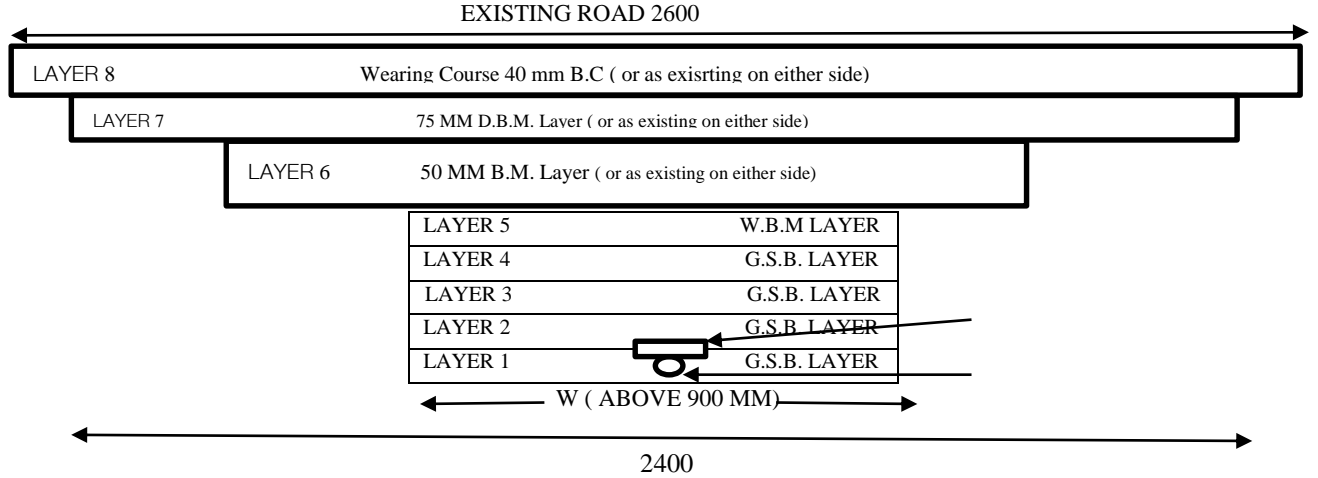
Layer No	PMC Item DSR code no	Description of Material	Remarks
Layer 1	Road part 2-8-1 88815	Granular Sub base Material	Sufficient watering and Ramming by Utility
Layer 2 & 3	Road part 2-8-1 88815	Granular Sub base Material	Sufficient watering and Ramming by reinstatement contractor
Layer 4 + 5	Road part 6-2-1 88941	Grit / Crushed sand / River sand cushioning & C.C.paver Block	-----

Note – 1) The thickness and No. of Layers Granular sub base material filling will depend on proposed depth of excavation as per application from utility Annexure -1

2) The maximum thickness of each layer of granular sub base material shall not be exceed 150 mm.

Annexure – 2

TYPICAL CROSS SECTION OF TRENCH FOR REINSTATEMENT OF ASPHALT ROAD



Layer wise details for item / materials to be used and its compaction

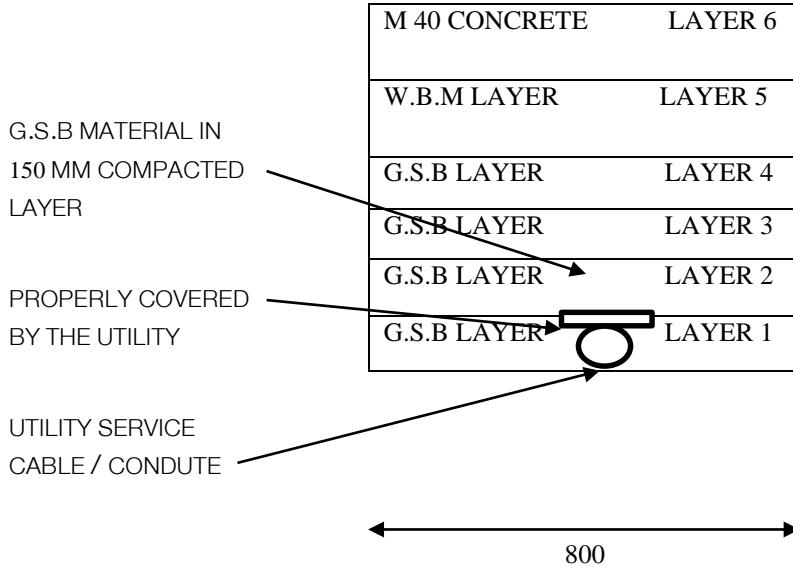
Layer No	PMC Item DSR Code	Description of Martial	Remarks
Layer 1 & 2	Road part 2-8-1 88815	Granular Sub base Material	Sufficient watering and Ramming by Utility
Layer 3 & 4	Road part 2-8-1 88815	Granular Sub base Material	Sufficient watering and Ramming by reinstatement contractor
Layer 5	Road part 2-10-1 88817	W.B.M. Material	Compaction by 10 Tones vibratory Roller by contractor
Layer 6	Road part 4-4-2 88835	Bituminous Macadam	Laying by Paver finisher and compaction by 10 tones Vibratory Roller
Layer 7	Road part 4-3-2 88833	Dance Bituminous Macadam	
Layer 8	Road part 4-5-2 88837	40 mm thick Bituminous Concrete	

Note – 1) The thickness and No. of Layers Granular sub base material filling will depend on proposed depth of excavation as per application from utility Annexure -1

- 2) The maximum thickness of each layer of granular sub base material shall not be exceed 150 mm.
- 3) Vibratory roller shall be used for compaction of each layer of road crust.
- 4) For deeper trenches for internal road of P.M.C. granular filling sub base below road crust may be restricted to maximum 10 layers (each of 150 mm. thickness) over well compacted backfilled earth / materials.

Annexure – 3

TYPICAL CROSS SECTION OF REINSTATEMENT FOR CABLE WORK



Layer wise details for item / materials to be used and its compaction

Layer No	PMC Item DSR Code	Description of Martial	Remarks
Layer 1 & 2	Road part 2-8-1 88815	Granular Sub base Material	Sufficient watering and Ramming by Utility
Layer 3 & 4	Road part 2-8-1 88815	Granular Sub base Material	Sufficient watering and Ramming by reinstatement contractor
Layer 5	Road part 2-10-1 88817	W.B.M. Material	Sufficient watering and Ramming by reinstatement contractor
Layer 6	Road part 5-15-3 89147	M 40 Concrete	-----

- Note – 1) The thickness and No. of Layers Granular sub base material filling will depend on proposed depth of excavation as per application from utility Annexure -1
- 2) The maximum thickness of each layer of granular sub base material shall not be exceed 150 mm.